Comments on Detrex's Source Remedy Modification and DS Tributary Excavation Work Plans

Fields Brook Superfund Site
Ashtabula, Ohio

June 27, 2011

Summary

Detrex has submitted a work plan to US EPA to convert the Dense Non Aqueous Phase Liquid (DNAPL) Remediation System, which was partially installed in 2002, at the Detrex Facility located in Ashtabula, Ohio (Facility) from an active to a passive system (URS, 2011a). Todate, Detrex has installed 14 of the 40 DNAPL extraction wells contemplated in the Source Control Operable Unit (SCOU) Record of Decision (ROD) that US EPA issued 14 years ago (US EPA, 1997a). As stated in the work plan, the existing (pilot) DNAPL recovery system consists of a performance-scale, vacuum-enhanced DNAPL recovery system that was designed to operate continuously. Detrex now proposes to install a combination of passive DNAPL collection measures, consisting of a 600 foot long trench and 18 additional recovery wells, along the perimeter of the former lagoon area, which was identified in the ROD as the primary DNAPL source area at the Facility (Figures 1 and 2). DNAPL-contaminated soils excavated from the proposed trench and recovery wells would be managed on-site, placed on the former lagoon area, and capped (Figures 3). As discussed in detail in the attached comments, the proposed remedy is fundamentally different from the remedy specified in the ROD – and in fact is similar to an alternative that US EPA expressly rejected in the ROD – and it will not achieve ROD-defined remedial action objectives crucial to the protection of Fields Brook. The remedy proposed by Detrex amounts to a passive "containment" remedy, which is not appropriate for a site with significant quantities of DNAPL, a Principal Threat Waste. The Fields Brook Action Group (FBAG) believes that active and aggressive treatment of the Principal Threat Waste (*i.e.*, Detrex DNAPL source areas) is a critical component of the remedy for the Detrex SCOU. The ROD-defined remedy is appropriate, is consistent with US EPA's Principal Threat Waste guidance and remedies selected by US EPA at similar sites, and can be implemented effectively, provided that proper design and operation parameters consistent with existing US EPA guidance are followed. The ROD-required remedial technology (vacuum-enhanced extraction) has been successfully used to remediate chlorinated DNAPL at other low hydraulic conductivity sites, and if properly implemented is capable of meeting the ROD-defined remedial objectives of extracting and destroying dissolved-phase, vapor-phase, and free-phase DNAPL presently located in the primary source area.

Detrex has also proposed sediment excavation in the DS Tributary, west of State Road, in response to the new DNAPL surface breakouts observed a little over a year after Detrex completed a limited removal action in the same area, as required by US EPA (URS, 2011b). The proposed sediment removal is consistent with US EPA guidance regarding "Removal Actions" (US EPA, 2000), given that DNAPL globules containing multiple toxic constituents (chlorinated volatile organics, hexachlorobenzene, hexachlorobutadiene) are readily accessible for exposure, thus posing a significant risk to human health and the environment. Furthermore, the continued manifestations of DNAPL at the DS Tributary are a clear indication that the containment measures implemented at the Facility are not effective and not complying with the ROD's primary goal of preventing recontamination of sediments as a result of continuing migration from source areas. In its proposal, Detrex acknowledges that the DNAPL observed in the DS Tributary originates from sources located in the subsurface or beneath the concrete

culvert under State Road – *i.e.*, that uncontrolled source material is continuing to migrate into DS Tributary sediments. Therefore, in addition to requiring removal of DNAPL already recontaminating the DS Tributary, US EPA should require that Detrex submit a comprehensive formal work plan to fully investigate the sources and mechanisms that have led to the continued DNAPL manifestations, and implement appropriate control measures to prevent DNAPL from entering and recontaminating the DS Tributary in the future.

Detailed FBAG Comments

1. Detrex's proposal to progress from the limited pilot DNAPL recovery system to implementation of a comprehensive remedy is correct in its intent, but the proposed system differs considerably from the SCOU ROD remedy and will not meet the ROD-defined objectives. Detrex should implement the remedy selected in the SCOU ROD. In addition to being the remedy mandated by US EPA, vacuum-enhanced extraction has been shown to work at other EPA sites and will expedite DNAPL removal.

(a) The ROD selected an aggressive DNAPL extraction and treatment remedy for the Detrex source area, consistent with US EPA guidance, since Detrex DNAPL is a Principal Threat Waste that poses an ongoing risk of recontamination to Fields Brook and the DS Tributary.

The Detrex remedy selected in the SCOU ROD (US EPA, 1997a), Alternative IV, consisted of "containment" and "treatment" elements. Containment was to be achieved using a slurry wall and groundwater withdrawal; and extraction and permanent destruction of DNAPL in the primary DNAPL source area were to be achieved using vacuum-enhanced extraction wells in and around the former lagoons (US EPA, 1997a). Treatment was a key component of the selected remedy because Detrex DNAPL is a Principal Threat Waste, as defined by US EPA guidance (US EPA, 1991). Consequently, the ROD selected a remedy that would treat the source area and minimize the recontamination risk of Fields Brook (SCOU ROD, p. 45):

> *"Alternatives IIB, III and IV satisfy the preference for treatment of principle threat contaminants (i.e., the DNAPL) that could potentially recontaminate Fields Brook sediment."*[1]

As rightfully acknowledged in the ROD (US EPA, 1997a), Detrex DNAPL meets US EPA (1991) criteria for Principal Threat Waste, defined as material that is: "highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur" (US EPA, 1991, p. 2). Given the high toxicity and mobility of the Detrex DNAPL and the significant amount of DNAPL present at the Facility [ROD estimated aerial extent of DNAPL was 11.5 acres (p. 11)], the emphasis placed by the ROD on removal and treatment of DNAPL in the Detrex source area was appropriate.

The ROD recommended installation of 40 vacuum-enhanced extraction wells to address the DNAPL. Among US EPA's key reasons for selecting this approach (Alternative IV) were that it would aggressively address all phases (residual, dissolved, vapor, and liquid) of the DNAPL (ROD, p. 45).

[1] Alternative IIB consisted of a slurry and source treatment using a deep trench system, whereas Alternative III consisted of a vacuum-enhanced extraction system, but no slurry wall.

*"DNAPL would be treated and destroyed under Alternatives IIB, III, and IV. However, more DNAPL removal is anticipated with the more **aggressive** (emphasis added) vacuum-enhanced groundwater/DNAPL removal systems (Alternative III and IV). All DNAPL that would be separated from groundwater would be destroyed by treatment or recycling. Dissolved-phase and vapor-phase DNAPL constituents would be absorbed onto activated carbon and would be destroyed during regeneration."*

The ROD's approach of selecting a remedy that addressed all phases of the DNAPL was also appropriate and consistent with US EPA guidance. The ROD stated that (p. 44):

"USEPA's TBC guidance indicates that long-term remediation objectives of DNAPL remedies should be to remove free-phase, residual and vapor phase DNAPL to the extent practicable."

Overall, the ROD selected a source remedy (vacuum-enhanced extraction) that would aggressively treat all phases of DNAPL at the Detrex Facility because DNAPL is a Principal Threat Waste. Given the significant volume of DNAPL present at the Detrex Facility, its high toxicity and mobility, and that the DNAPL would present significant risks to human health or the environment should exposure occur, the remedial approach selected in the ROD was appropriate.

(b) The DNAPL remedy that Detrex now proposes is inconsistent with the remedy specified in the ROD. It is a passive containment system that only addresses free-phase DNAPL at the perimeter of the primary source area. Since the proposed remedy is significantly different from the remedy selected in the ROD, a ROD amendment or ESD would be required in order to implement this approach.

Detrex has been operating a pilot DNAPL removal system at the Facility for 9 years that consists of 14 DNAPL recovery wells. DNAPL currently collects in these wells via gravity (*i.e.*, passively). DNAPL thickness in the wells is monitored by Facility personnel once every two weeks (manually), and then the DNAPL/ groundwater mixture is removed and treated. To date, Detrex has only removed 16,000 of the estimated 250,000 gallons of DNAPL in the primary source area. The remedial system proposed by Detrex would consist of an expanded passive collection system comprised of 18 additional wells and a collection trench. The proposed DNAPL collection wells and trench would be located outside of the lagoon area (Figures 1 and 2). The proposed system would be entirely passive. Facility personnel would periodically monitor and manually remove DNAPL, as they do now.

The current pilot system and the proposed system are "containment" systems aimed at collecting DNAPL that may flow into the wells/trench. These remedies do not meet the "treatment" requirement for a Principal Threat Waste [discussed in section (a) above], and they are fundamentally different from the "more aggressive" remedy that US EPA expressly adopted in the ROD. Detrex's consultant, URS, has acknowledged that the system proposed is a "containment" remedy. Specific differences between the remedy proposed by Detrex and the remedy mandated by the ROD include the following:

- The ROD selected vacuum-enhanced extraction to *aggressively* remove DNAPL, contaminated groundwater, and vapors at the Detrex Site. In contrast, the pilot system and proposed remedy are not taking any active steps to recover contaminants, but rather rely on gravity drainage to collect DNAPL – the most passive approach possible and the complete opposite of the aggressive remedy mandated by the ROD.
- The ROD required the installation of vacuum-enhanced recovery wells within the footprint of the former lagoon area – an approach that would maximize contaminant mass removal rates. However, the remedy that Detrex proposes would be limited to placement

of DNAPL recovery wells and a collection trench along the outside edges of the former Detrex lagoon area. Detrex has a fundamentally different remedial goal for the source area (*i.e.*, containment), not maximizing DNAPL extraction and treatment. Passive collection of DNAPL along the outside edges of the lagoon area, rather than throughout the lagoon area, is a much less efficient remedial approach.

- The current pilot system and the proposed system will only target free-phase DNAPL that will flow passively (due to gravity) into the wells and/or recovery trench. In contrast, consistent with US EPA guidance, the ROD required that all phases of DNAPL (residual, vapor, dissolved, and free-phase) be addressed by the remedy selected.

Overall, the current pilot system and the proposed system constitute a fundamentally different remedial approach from that required by the ROD. The remedy being implemented/proposed is a "containment" remedy that does not meet US EPA's "treatment" requirement for Principal Threat Waste sites.

(c) A system analogous to the deep trench DNAPL collection system proposed by Detrex along the southern and eastern perimeter of the former impoundment area was previously evaluated and rejected in the ROD (Alternative IIB). Implementation of the Detrex deep trench proposal will require a ROD amendment or, at a minimum, an ESD that provides a clear rationale for departing from the previously selected remedy.

As previously discussed, Detrex is proposing to install a 600 foot long, passive, DNAPL collection trench along the southern and eastern edge of the former lagoon area (Figure 2). The proposed trench will be approximately 28 to 30 feet deep, 1.5 feet wide, and backfilled with granular material. The trench will be sloped to drain to a single sump, where DNAPL accumulation will be manually monitored, and collected liquids will be pumped out (URS, 2011a).[2]

The ROD evaluated a similar deep trench system, approximately 2,300 feet long and 25 feet deep - Alternative IIB in the ROD (US EPA, 1997a). As part of this alternative, DNAPL and contaminated groundwater were to be "actively" pumped using submersible pumps. During the remedy selection process, Alternative IIB was rejected and Alternative IV (vacuum-enhanced extraction) was selected. Reasons that US EPA gave for that decision included (US EPA, 1997a, p. 44-46):

- Although both alternatives (IIB and IV) satisfied the preference for treatment of Principal Threat Waste (*i.e.*, the DNAPL that could potentially recontaminate Fields Brook sediment), because both entailed active measures to extract and treat DNAPL, Alternative IV would address all DNAPL phases (residual, vapor, dissolved, and free-phase). This satisfied US EPA's TBC guidance that DNAPL remedies should remove free-phase, residual, and vapor phase DNAPL to the extent practicable.
- Higher DNAPL removal rates were anticipated with the more aggressive vacuum-enhanced groundwater/DNAPL removal system than with the trench. This was in-part because vacuum-enhanced recovery is a more aggressive treatment technology than pumping liquids from a trench and because the wells would target the impoundment area

[2] The Work Plan (URS, 2011a) does not provide any details on the techniques to be used for DNAPL accumulation monitoring (Section 3.2.4, p. 3-4). In addition, the Work Plan does not provide details on the decision criteria to be used to pump out the sump contents. For example, is Detrex proposing only to remove DNAPL? Will any measures be taken to remove contaminated groundwater, as mandated by the ROD? Will any groundwater quality data be collected to understand what is flowing into the sump? It also is not clear whether DNAPL that collects in the gravel-lined trench, as Detrex has proposed, will be visible and accessible for removal, or whether it will accumulate within the gravel layer at the bottom of the trench, and be inaccessible.

itself instead of being limited to the edges of the area (*i.e.*, the perimeter trench approach).

- Vacuum-enhanced extraction would lower the groundwater table and reverse groundwater gradients between the primary source area and the slurry wall, thereby further reducing the likelihood of DNAPL migration away from the primary source area.

The current Detrex deep trench proposal is even more passive (*i.e.*, even more inefficient) than the deep trench alternative that was previously rejected in the ROD. Alternative IIB in the ROD utilized submersible pumps to remove DNAPL and groundwater. The current proposal includes one sump, manual DNAPL thickness measurements, and no clearly enumerated procedures for DNAPL and contaminated groundwater removal. As stated in (b) above, the deep trench remedy proposed by Detrex fails to meet the remedial objectives specified in the ROD – a reason that this alternative was previously considered and rejected in the ROD. Departure from the previously approved remedy to allow implementation of the Detrex deep trench proposal will require a ROD amendment or ESD. For all the reasons US EPA stated in the ROD, such a ROD amendment or ESD would not be justifiable.

(d) The ROD-defined remedy was appropriate, consistent with US EPA's Principal Threat Waste guidance, and in keeping with remedies selected and instituted at other DNAPL sites. Vacuum-enhanced extraction has been used successfully to remediate a number of other chlorinated DNAPL mixture sites, and if properly implemented will successfully extract DNAPL from the primary source area at the Detrex Facility.

The FBAG strongly believes that the remedy selected by US EPA in the SCOU ROD for the Detrex Facility was and remains the appropriate remedy since it complied with the nine remedy selection criteria specified in the National Contingency Plan (NCP) and with US EPA's guidance for Principal Threat Waste and DNAPL sites. Furthermore, it remains consistent with contemporary wisdom that reaffirms the application of aggressive source control measures at large DNAPL sites, and with other remedy decisions currently being made by US EPA.

The ROD correctly selected a remedy that offered the highest degree of protection by removal and treatment of all phases of DNAPL in an "aggressive" manner. Given that Detrex DNAPL was a Principal Threat Waste, US EPA rightfully realized the need for selecting an aggressive remedial approach to remove and treat DNAPL in the Detrex primary DNAPL source area. In the ROD, US EPA rejected passive containment as the principal remedy precisely because it did not provide adequate protection against the threat that continuing migration of DNAPL would pose both to the remedy completed in the Sediment and Floodplain Operable Units and to human health and the environment, should DNAPL break out into Fields Brook and the DS Tributary. The lack of aggressive remediation at the Detrex Facility and a nine-year delay in implementing a full-scale DNAPL remedy is partly responsible for continued DNAPL breakouts at the DS Tributary (discussed in #2, below). Given this history, as the remedy gets scaled up from a pilot system, it is critical that the ROD-mandated remedy be implemented at the Detrex Facility.

The selection of an aggressive remedial approach for the Detrex Facility in the SCOU ROD was not only appropriate but is consistent with the remedial philosophy being applied by US EPA at other Principal Threat Waste sites. Where large quantities of DNAPL are present in the subsurface, as is the case here, US EPA has required that aggressive measures be undertaken to excavate, flush, extract or otherwise remove DNAPL. In such instances, US EPA has been clear that containment is not an appropriate option. For example, at the Ashland/Northern States Power Lakefront Site, located in Ashland County, Wisconsin (a US EPA Region 5 site), the ROD issued in September 2010 requires excavation and disposal of 286,000 yd^3 of DNAPL-contaminated sediment (US EPA, 2010). In addition, a review of US EPA's ROD database indicates that US EPA has consistently required implementation of aggressive source removal and/or treatment remedies at Principal Threat Waste sites.

The remedial approach selected at the Detrex Facility is a proven technology that has been successfully used to remediate a number of DNAPL sites around the country. The ROD acknowledges in numerous places that vacuum-enhanced extraction is a proven approach:

> *"Vacuum-enhanced extraction wells (Alternatives III and IV) are effective and reliable…." (p. 44)*

> *"The technologies included under Alternatives IIA, IIB, III, and IV are demonstrated technologies that have been constructed at similar sites. ……..There are no expected difficulties or uncertainties associated with construction of the vacuum-enhanced extraction well system in Alternatives III and IV. Recent pilot-scale tests completed at the site have evaluated the feasibility and effectiveness of the technology in extracting DNAPL and groundwater. Based on these preliminary tests, the technology is feasible, although yields will be relatively low." (p. 46)*

Since the issuance of the ROD, US EPA guidance documents have become available presenting best practices, technical considerations, and case studies associated with vacuum extraction technologies (also sometimes referred to as Multi-Phase Extraction or MPE). Examples of these resources include: Multi-Phase Extraction - State of the Practice (US EPA, 1999) and Multi-Phase Extraction Technology for VOCs in Soil and Groundwater (US EPA, 1997b). These guidance documents clearly indicate that vacuum-enhanced extraction is one of the remedial technologies appropriate for remediating low hydraulic conductivity sites contaminated with DNAPL and is the presumptive remedy at VOC sites with soil and groundwater contamination. These and other documents present a number of case studies/sites where this remedial approach has been successfully used to remediate DNAPL-impacted sites (US EPA, 1997b, 1999; NNEMS, 2010).

Detrex has alluded to difficulties associated with implementing the remedy at the Facility in a number of submittals (URS, 2011a). Based on a review of Site conditions and remedial system design/ implementation at the Facility, FBAG believes that the implementation difficulties experienced at the Site are attributable to the manner in which the remedy has been implemented, and not due to any technology limitations. FBAG previously submitted a detailed critique of the remediation approach implemented at the Detrex Facility (Gradient, 2009), included as Attachment A. There are several deficiencies in the remedy implementation approach that have led to operational difficulties. For example, one of the key issues is the choice of vacuum applied at the Site. The US EPA MPE guidance document (US EPA, 1997b) clearly specifies that for low hydraulic conductivity formations, such as that present at the Facility, high vacuum (18 to 26 inches of mercury) should be applied. However, relatively low vacuum (1 to 2 inches of mercury), which is not suitable for deposits present at the Facility, has been utilized. This and other deficiencies in the pilot implementation approach (Gradient, 2009), and not inherent technology limitations, are responsible for the remedy implementation issues experienced to date. We believe that a vacuum-enhanced remedial system design that complies with best practices presented in US EPA guidance documents can be successfully implemented in the Detrex primary DNAPL source area, given the extensive and proven track record for this remedial technology.

(e) The Detrex remedial plan to manage contaminated soils at the Facility by creation of a DNAPL Soils Management Area is not consistent with the ROD, violates CERCLA's preference for permanent treatment, and would pose an impediment to future remedial efforts mandated by the ROD in the primary DNAPL source area.

Detrex is proposing to place DNAPL-contaminated soils generated from the drilling of additional DNAPL recovery wells and the proposed DNAPL collection trench in a DNAPL Soil Management Area to be located in the center of the primary DNAPL source area. The DNAPL Soils Management Area will contain approximately 850 yd^3 of soils, have a foot print of approximately 0.35 acres, and will be covered with a HDPE and geotextile cap (URS, 2011a).

Detrex's proposal to manage contaminated soils on-site and to create a DNAPL Soil Management Area constitute significant deviations from the ROD. The proposed approach will create a permanent waste management area, which in all likelihood, will contain DNAPL-saturated soils. In addition, creation of this capped waste management unit will effectively eliminate access to this area for installation of vacuum-enhanced recovery wells. Placing additional DNAPL-contaminated soils in the primary source area would not result in any permanent treatment and would not mitigate any risks associated with this material. Such a fundamental change in remedy would require a ROD amendment or ESD, at a minimum. Documenting a defensible rationale consistent with the NCP for such a change would at best pose a substantial challenge.

(f) The design of the proposed DNAPL recovery wells will not result in capture of DNAPL previously encountered at shallow depths at the Facility.

As indicated in a schematic for vacuum-enhanced extraction in the SCOU Feasibility Study (WWC, 1995; see attached Figure 4), one of the key reasons for selecting vacuum-enhanced extraction as the preferred remedy was that it would induce DNAPL constituents to flow *via* all phases (vapor, dissolved, and free phase) into the recovery wells, regardless of the depth at which the DNAPL material was present. Detrex, by contrast, is proposing DNAPL recovery wells that will be screened at the base of the lacustrine clay (5 foot screen, with the screen bottom located at a depth of 15 to 25 feet below ground surface) and will only passively collect mobile DNAPL. Prior investigations conducted at the Detrex Facility have encountered DNAPL and/or soil concentrations indicative of DNAPL at shallow depths. For example, the log for boring DETSB15 indicated the presence of DNAPL at 5 to 7 feet below ground surface. The proposed well design would not intercept such DNAPL since the proposed well screens are too deep, especially given that no vacuum will be applied to induce DNAPL migration to the recovery well.

2. The continued manifestations (surface breakouts) of Detrex DNAPL in the DS Tributary immediately downstream of the Detrex containment system undermines the short term protectiveness of the Detrex Remedy – a conclusion reached in US EPA's 2009 Five Year Review for the Fields Brook Site.

(a) Detrex needs to reassess the adequacy of and make major improvements to the migration control measures to prevent continued DNAPL migration to the DS Tributary.

Surface breakouts of Detrex DNAPL have been observed repeatedly in the DS Tributary, immediately west of State Road, starting in about 2005. DNAPL was not observed in this portion of the DS Tributary during the remedial investigation (in the 1990s) or when soil/sediment remediation was undertaken in the Sediment and Floodplain Operable Units in 2001. Hence, no remediation was initially required in this area. After DNAPL was observed in the DS Tributary (and Fields Brook) in 2005, US EPA (2006) concluded that Detrex was responsible for remediating the DS Tributary. Three years later, in 2009, Detrex removed approximately 46 yd^3 of soil/sediment from the DS Tributary, west of State Road (URS, 2010). Two feet of soil/sediment were removed from the DS Tributary streambed and its vicinity (URS, 2010).

The protectiveness of the Fields Brook Superfund Site remedy was evaluated by US EPA as part of its Second Five-Year Review for the Fields Brook Site in 2009 (US EPA, 2009). The Five Year Review addressed the manifestations of DNAPL in the DS Tributary and concluded that:

> *"In addition, the continued assessment of the contamination seen in the DS Tributary, just west of State Road, may ultimately lead to a reassessment of the short-term protectiveness of the remedy. If investigations indicate that the DNAPL in the DS Tributary is due to a failure of the existing DNAPL control measures, additional work will be required to correct the situation." (p. 27)*

As anticipated in US EPA's Second Five-Year Review, the problem of DNAPL manifestations and need for assessments in the DS Tributary, west of State Road, persists. Despite removal of DNAPL-contaminated sediments from the DS Tributary west of State Road in November 2009, DNAPL surface breakouts were again observed in this area in April 2011, *i.e.*, a little over the year after the area had been remediated. In addition, as indicated in the photographs included in Attachment B, evidence of contamination (*i.e.*, oil sheens and strong odor) was noted in the DS Tributary east of State Road during field reconnaissance conducted on June 16, 2011. The circular concrete culvert, east of State Road that connects with the box culvert, which discharges west of State Road, was also found to have no bottom, thereby enabling groundwater to readily enter the culvert. These observations qualitatively indicate the presence of contamination within the DS Tributary, east of State Road, that can readily migrate *via* the stream to the west.[3] It is clear that more is required than excavating formerly clean sediment from the DS Tributary. The DNAPL source material that is causing recontamination of the sediment must be controlled.

There is no dispute that the source of the DNAPL recontaminating the sediment is located outside of the Sediment Operable Unit. In addition, in its June 8, 2011 letter to US EPA (URS, 2011b), Detrex acknowledges that there is Detrex DNAPL in areas beyond the slurry wall that Detrex installed as a source control measure. Therefore, it is clear that source control measures at the Detrex Facility have been ineffective in preventing continuing migration of Detrex DNAPL.

As US EPA recognized in its Second Five-Year Review, renewed manifestations of DNAPL in the DS Tributary undermine the short term protectiveness of the Detrex remedy. The fact that DNAPL is being observed in the DS Tributary west of State Road only about a year after it was remediated, and contamination appears to be present in the area east of State Road that Detrex previously addressed as part of its original source area remedy, conveys the gravity and urgency of the problem. This is also indicative of the mass of DNAPL that is present on the Detrex Facility and is the exact situation that US EPA's Principal Threat Waste guidance document was written to address (*i.e.*, need for aggressive remedial actions at the source because containment measures alone cannot reliably control migration).

(b) The additional excavation of sediment from the DS Tributary proposed by Detrex is a necessary first step, consistent with US EPA guidance for emergency removal actions, but additional long-term actions are needed to assess and improve the Detrex migration control measures.

Detrex has proposed to once again excavate DNAPL-contaminated sediments from the DS Tributary west of State Road (URS, 2011b). This proposed action is consistent with US EPA guidance regarding "Removal Actions" (US EPA, 2000), given that DNAPL globules containing multiple toxic constituents are readily accessible for exposure, and consequently pose a significant risk to human health and the environment. However, several additional investigative steps need to be undertaken to fully

[3] Surface water and sediment samples, from the DS Tributary east of State Road, were obtained and submitted for laboratory analysis. These sampling results will be submitted to US EPA once available.

understand the mechanism of continued DNAPL migration into the DS Tributary. Furthermore, the rapidity at which sediments remediated in November 2009 have become recontaminated, and the potential presence of contamination in the DS Tributary east of State Road, underscore the urgency with which these investigative steps need to be undertaken so that protective measures may be implemented without delay.

In the current work plan, Detrex has proposed to evaluate the material underneath the culvert under State Road, *i.e.*, to evaluate one potential source of DNAPL in the DS Tributary (URS, 2011b). The work plan states that "An attempt will be made to excavate beneath the concrete culvert underneath State Road to evaluate the presence of DNAPL beneath the culvert." This vaguely worded proposal to investigate the culvert is inadequate. US EPA should require Detrex to submit a comprehensive and detailed work plan for addressing all Detrex DNAPL that exists beyond existing control measures. To avoid further delays likely to result in further deterioration in environmental conditions, US EPA should impose a clear and enforceable schedule not only for completing a systematic assessment but also for implementing effective and reliable source control measures. If comprehensive investigations are not undertaken now to fully understand and eliminate DNAPL migration mechanisms in this area, we are concerned that DNAPL migration will once again contaminate the DS Tributary and recontaminate Fields Brook.

References

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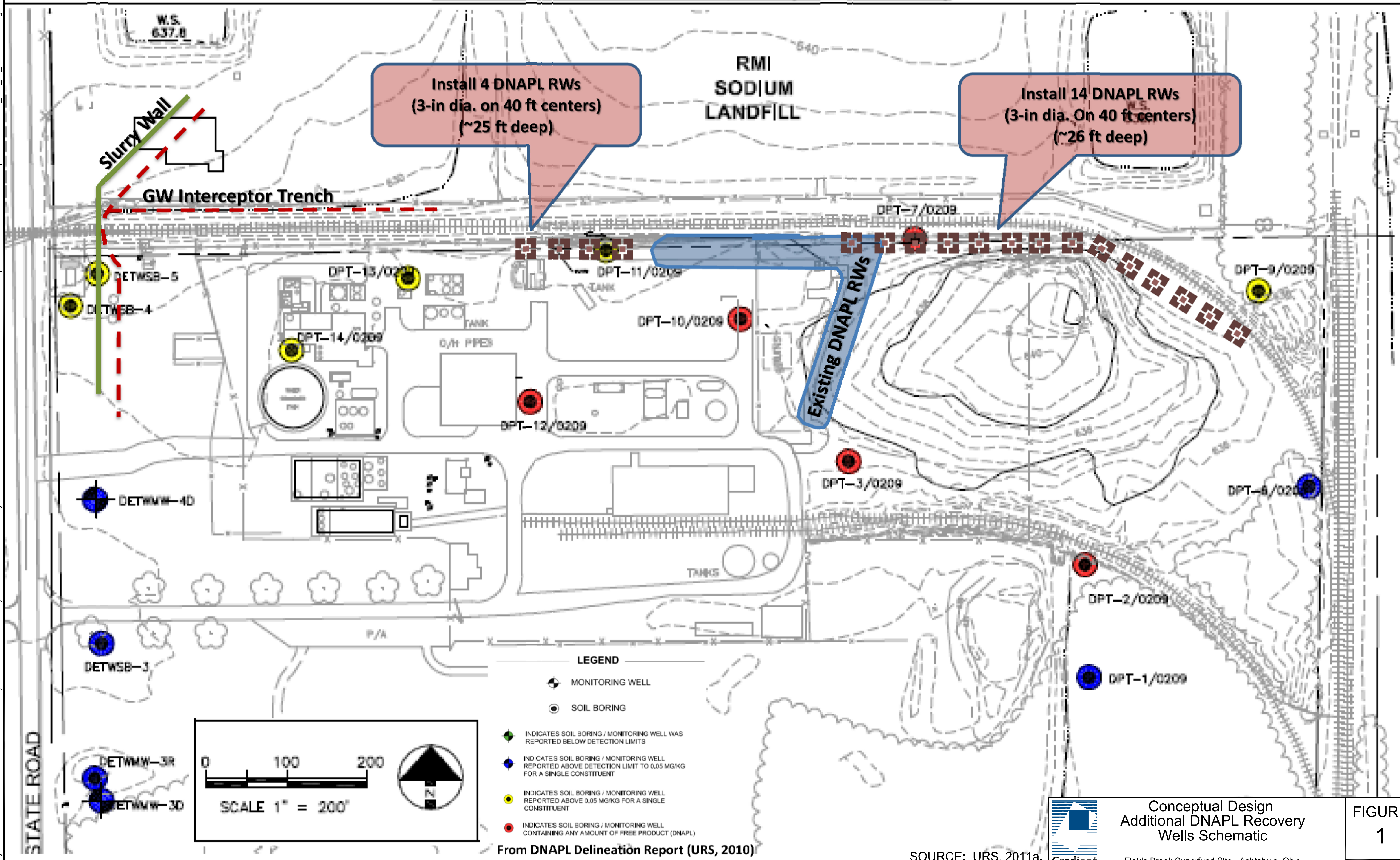
Figures

Detrex Site – Ashtabula, OH (Aerial View)



Gradient

Conceptual Design
Additional DNAPL Recovery
Wells Schematic

Fields Brook Superfund Site - Ashtabula, Ohio

FIGURE
1

Date: 06/27/2011

File Path: G:\Projects\206035 Fields Brook\Graphics\104\206035_104_01_conceptual.dwg

Coordinates System:

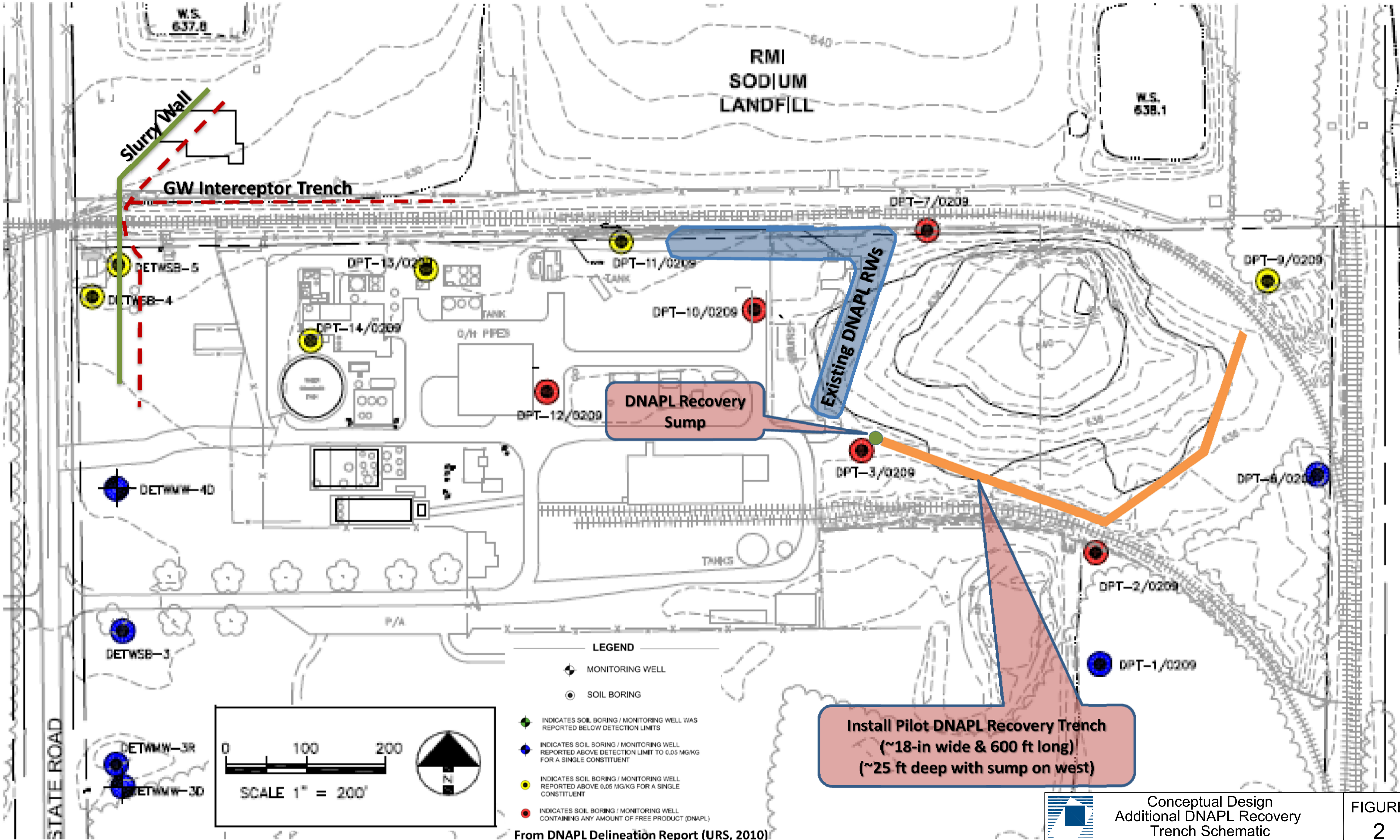
Checked By: MHS

Drawn By: MMJ

PM: MHS

Project No.: 206035

Detrex Site – Ashtabula, OH (Aerial View)



SOURCE: URS, 2011a.

Gradient

Conceptual Design
Additional DNAPL Recovery
Trench Schematic

Fields Brook Superfund Site - Ashtabula, Ohio

FIGURE
2

Date: 06/27/2011

File Path: G:\Projects\206035 Fields Brook\Graphics\104\206035_104_01_conceptual.dwg

Coordinates System:

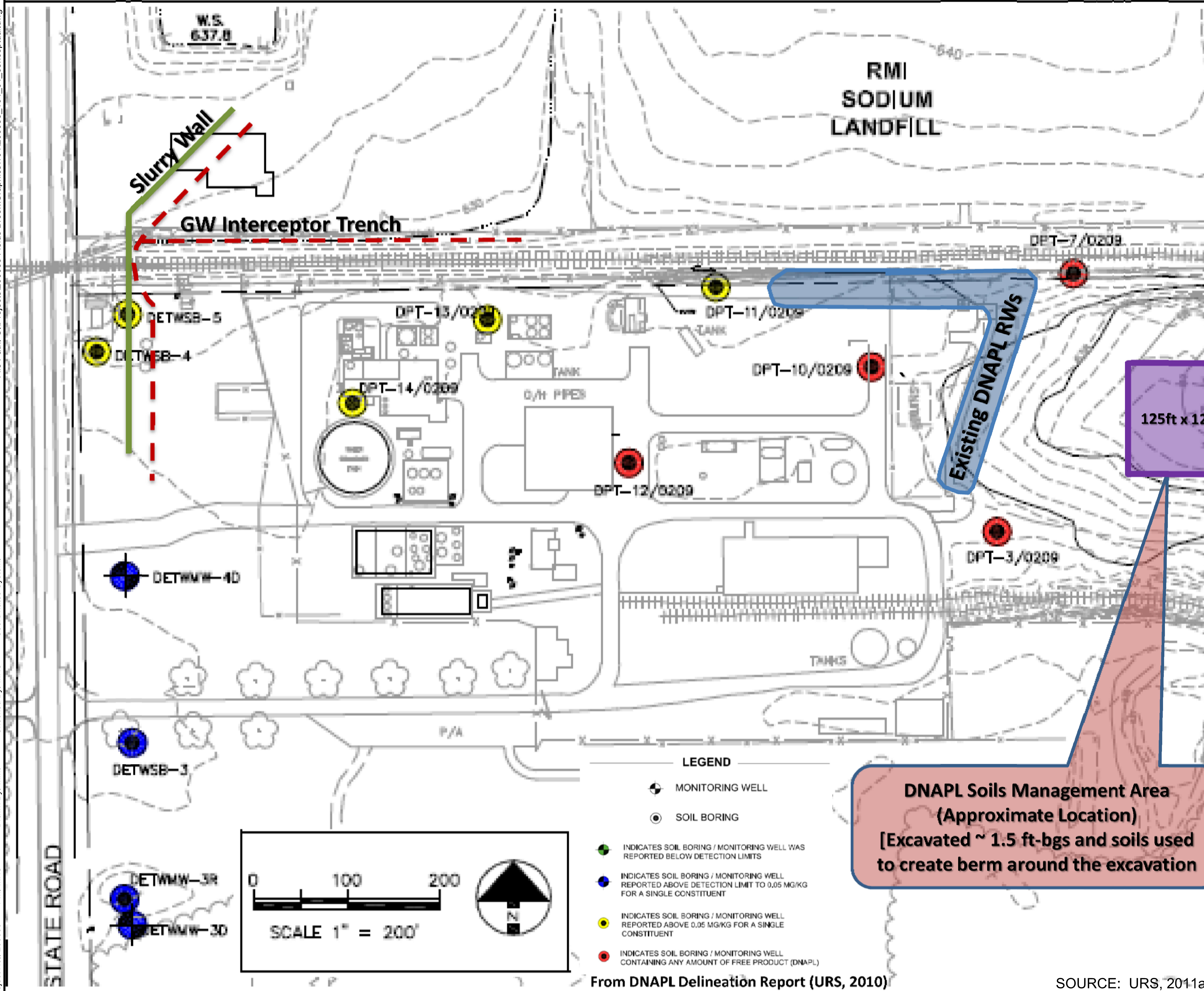
Checked By: MHS

Drawn By: MMJ

PM: MHS

Project No.: 206035

Detrex Site – Ashtabula, OH (Aerial View)



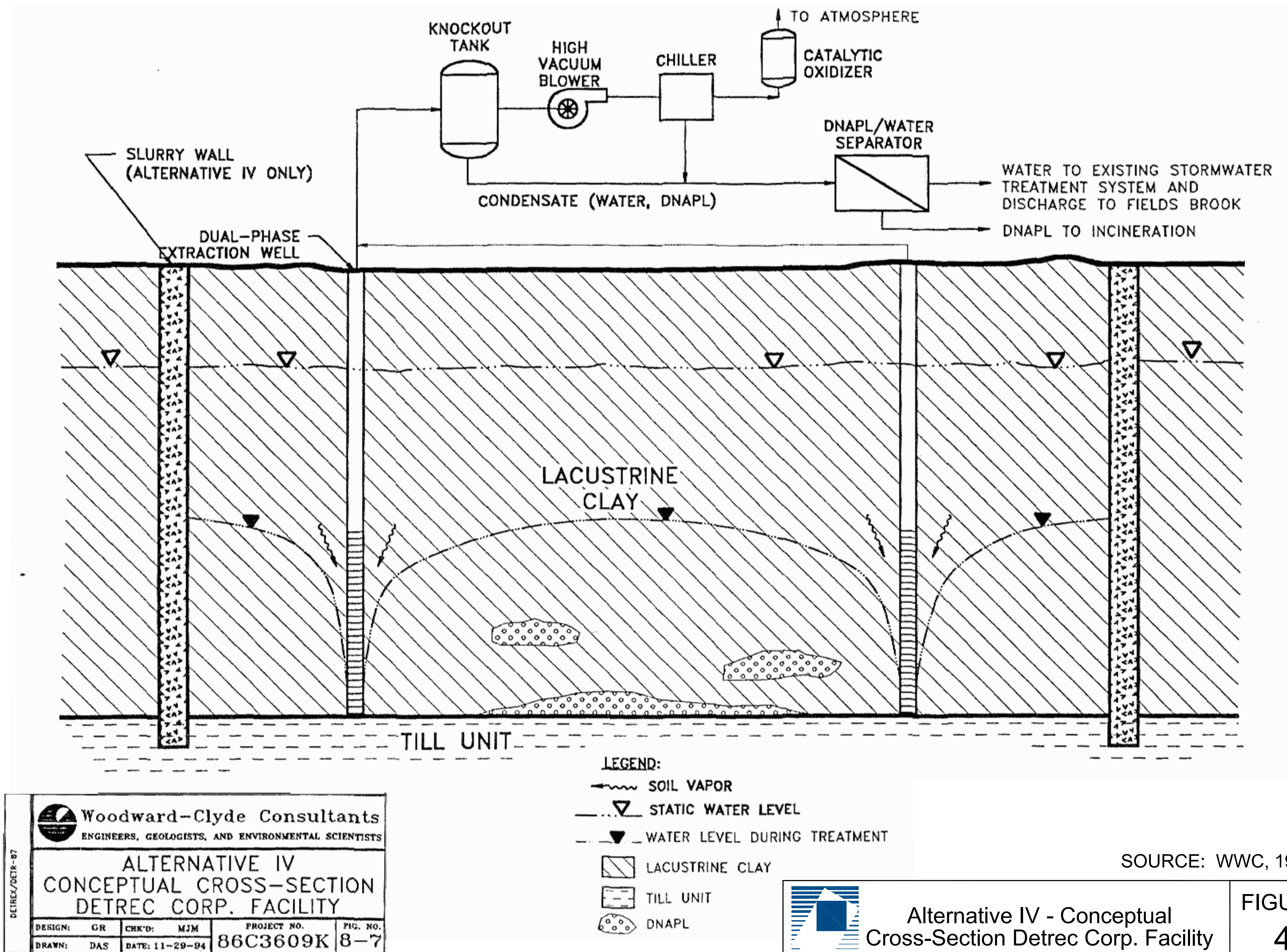
Conceptual Design DNAPL Recovery Soils Management Area Location

Fields Brook Superfund Site - Ashtabula, Ohio

FIGURE 3

Date: 06/27/2011

Project No.: 206035 PM: MHS Drawn By: MMJ Checked By: MHS Coordinates System: File Path: G:\Projects\206035 Fields Brook\Graphics\104\206035_104_01_conceptual.dwg



SOURCE: WWC, 1995.

Alternative IV - Conceptual Cross-Section Detrec Corp. Facility

Fields Brook Superfund Site - Ashtabula, Ohio

Gradient

FIGURE 4

Date: 06/27/2011

Attachment A

July 15, 2009 Letter to US EPA, Region 5

July 15, 2009

Leah Evison, Ph.D.
U.S. EPA Region 5
77 W. Jackson Blvd.
Chicago, IL 60604-3507

**Subject: Detrex's Proposed Source Control Enhancements
Fields Brook Superfund Site, Ashtabula, Ohio**

Dear Leah:

Gradient and FBAG have reviewed Detrex's proposed Source Control enhancement proposal[1] and other related documents.[2,3] The Detrex Source Control enhancement proposal is inadequate relative to the scale of the DNAPL problem and will not accelerate DNAPL removal rates, a critical and urgent performance criterion for effective source control. Until mobile DNAPL is reduced to residual state, it will continue to migrate in multiple directions from the source zone and impact Fields Brook and the completed remedial actions. The current Detrex pilot system suffers from several design deficiencies and is operated sub-optimally by Detrex. Consequently, DNAPL thicknesses within the limited area influenced by the pilot system have not declined in over 6 years of operation. On the order of 10 feet of DNAPL continually accumulates in wells (see attached Figure 1) despite over 15,000 gallons of DNAPL having been removed. This is clear evidence that DNAPL in the source area is mobile. Given the limited spatial coverage of the current system, the vast majority of DNAPL that is present at the Detrex facility migrates *via* multiple subsurface preferential pathways (*e.g.*, clay fractures, utilities such as the CEI conduit and the North Sewer) away from the pilot system. Detrex needs to take aggressive source remediation steps now to address this serious issue.

1. The current Detrex Source Control system is under-sized, poorly designed, and does not utilize EPA-recommendations/Best Practices for Soil Vapor Extraction/Dual Phase Extraction (SVE/DPE) systems.

The current Detrex SVE/DPE system is a small pilot unit installed in October 2002 that which was never "scaled-up." The system consists of 12 two-inch diameter extraction wells, which affect only a small fraction of the 500,000 square foot DNAPL source area (note, the 1997 ROD design called for 40 wells). In addition, the system design does not conform to best practices set forth in EPA guidance[4] for SVE/DPE systems and has the following major deficiencies:

- The current SVE/DPE well configuration (a V-like shape) does not provide adequate spatial coverage over the DNAPL footprint to efficiently remove contaminants. In low permeability soils, the radius of influence associated with a

[1] URS Corporation. 2008. Interim Operations and Maintenance Manual, Detrex RD/RA Source Control Area – Detrex Facility, Ashtabula, Ohio. June 2008.
[2] URS Corporation. 2004. Operation & Maintenance Manual, Source Control & Vacuum-Enhanced DNAPL Recovery System – Detrex Facility, Ashtabula, Ohio. March 2004.
[3] Detrex Corporation. 2009. Monthly Status Report – April 2009, Fields Brook Superfund Site, Detrex Source Area, Ashtabula, Ohio. May 14, 2009.
[4] US EPA. 2004. How to Evaluate Alternative Cleanup Technologies for Underground Storage Tank Sites – A Guide for Corrective Action Plan Reviewers. Office of Solid Waste and Emergency Response. EPA 510-R-04-002. May 2004.

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SVE/DPE well is small, thereby requiring a closely spaced network of wells. Typically, spacing of SVE/DPE wells is defined on the basis of radius of influence data collected during a pilot test. It is not clear that such information has been collected at the site. Absent such site-specific data and using a typical radius of influence of 5 feet for fine grained soils (USEPA, 2004), the current system covers less than 1% of the 500,000 square feet DNAPL plume defined in the 1997 ROD. Even if the site-specific radii of influence were somewhat higher, the current system's spatial coverage is extremely small given the extent of contamination.

- The vacuum SVE/DPE blower being utilized is inappropriate for the site's sub-surface conditions. In low permeability silt/clay soils found at the Detrex facility, a high-vacuum blower (rotary lobe or liquid ring) is needed to effectively extract contaminant mass (USEPA, 2004). However, the Detrex system utilizes a mid-range vacuum pump that is not appropriate for the site, resulting in sub-optimal contaminant removal rates.
- The small diameter (2-inches) of the SVE/DPE wells limits the operational efficiency of the system and greatly limits operational flexibility. For example, if the wells were 4-inch in diameter, a submersible water withdrawal pump could be placed in the well to simultaneous remove DNAPL and groundwater, while the vacuum pump extracts vapors – a proven approach known as Vacuum Enhanced Pumping (VEP).
- Finally, air injection wells are often required in low permeability soils/strata to provide the necessary air flow and to prevent short-circuiting of extraction wells (USEPA, 2004). Such wells have not been installed.

2. The Detrex Remedy is not being operated efficiently and the operational problems are a manifestation of the poor design.

Although the SVE/DPE wells have an approximately 15 feet long well screen, only the lower 1 to 2 feet is "open," with the remainder having been blocked off using a solid riser. This design modification and the manner in which the system is being operated (*i.e.*, only during business hours) are key elements contributing to the poor perceived system performance.

- Since a majority of the SVE/DPE well screen is blocked off and groundwater and DNAPL (total liquid thickness of approximately 15 feet) accumulates in the wells, it does not appear that any air flow is induced in the subsurface by vacuum application.[5] Therefore, the current system is largely removing liquids and very limited vapors – an extremely inefficient approach for remediating a VOC-dominant DNAPL that is best remediated by vapor removal.
- Detrex's decision to operate the system manually, only during business hours, is extremely inefficient and inexplicable. The intermittent operation of the system allows groundwater to flow back into wells when the system is not operating – a less than ideal scenario. For effective contaminant mass removal in this setting, the sub-surface needs to be dewatered by continuous groundwater extraction, in conjunction with vapor flow induced by vacuum application.

[5] We could not find any air flow rate or VOC vapor removal rate data in the Detrex documents (*e.g.*, in the O&M report). Such data are critical for understanding system performance and is typically presented in O&M reports.

- The remedy system O&M difficulties reported by Detrex (*e.g.*, well siltation) is a symptom of poor system design and operation. These O&M difficulties could be caused by the poor choice of vacuum blower and inappropriate sizing of the well's filter pack. DPE/SVE is a proven technology and has been effectively applied at numerous sites around the country in similar low permeability settings. Therefore, the operational difficulties are a design, and not a technology efficacy issue.

3. Despite the system's limitations, it continues to recover DNAPL mass – an indication of the volume of DNAPL present in the sub-surface.

The system has recovered 15,680 gallons of DNAPL as of April 2009, a remarkably large volume, given the limited scale of the system and the inefficient manner in which it is being operated. However, DNAPL thicknesses have not declined appreciably since system operations began and DNAPL continues to flow into the wells (Figure 1). These findings are important for two reasons:

- First, continued DNAPL accumulation in wells is clear, indisputable indication of its subsurface mobility. Furthermore, DNAPL migration into the pilot system's area of influence, only a small fraction of the larger plume area, causes major concern over the fate of the mobile DNAPL beyond the area of influence of the extraction wells.
- Second, the collection of this volume of DNAPL in a poorly designed, sub-optimally operated pilot-scale system is clear indication of the vast DNAPL reservoir (previously estimated to be at least 250,000 gallons) that remains at the Detrex facility. In addition, these DNAPL recovery data demonstrate that much higher DNAPL recovery, a critical component of effective source control, can be achieved at the Detrex site using a properly designed, installed and operated system.

4. The proposed system enhancements are inadequate; Detrex needs to take more aggressive steps to enhance DNAPL and contaminant mass recovery.

Detrex proposes a gravity-drain system consisting of a line of wells or a collection trench along a portion of the northern Detrex property boundary. Accumulated DNAPL will be pumped out monthly. This proposed system is technically ineffective and spatially deficient because:

- The proposed "enhancements" are “passive” systems (monthly DNAPL removal) similar to the current Detrex system, which is being operated manually at an unknown frequency. Consequently, the enhancement will likely further reduce DNAPL removal rates, not increase them.
- The focus on a limited area to the north of the source area is perplexing in that it does not focus on identified preferential pathways (*e.g.* CEI conduit and the North Sewer) that require immediate action to prevent continued impacts to Fields Brook.

What is needed is an aggressive system that actively targets and removes DNAPL and VOC mass from the sub-surface. The system needs to be designed to achieve the critical source control objective of reducing DNAPL to a residual, non-mobile state, and to do so in a timely manner. This means that it not only needs to be properly designed, but also correctly located spatially and effectively operated until the design objectives are achieved. USEPA (2004) clearly states that an SVE/DPE system will recover more DNAPL overall and at a faster rate than a gravity drain system[6].

Finally, a properly designed and implemented SVE/DPE system is an essential building block for remediating such a site and can later be augmented by more aggressive in-situ thermal treatment technologies (*e.g.*, steam injection, six-phase heating, *etc.*). The scientific literature is replete with case studies of successful application of SVE/DPE-based applications in geologic formations and under similar conditions to that at Detrex's property.[7,8] It has been done elsewhere and urgently needs to be done here.

Overall, Gradient and FBAG believe that Detrex needs to implement more effective source remediation measures immediately at their property. We would be happy to further discuss our thoughts on this topic at your convenience.

Please feel free to call me if you have questions or would like to discuss this further.

Yours truly,

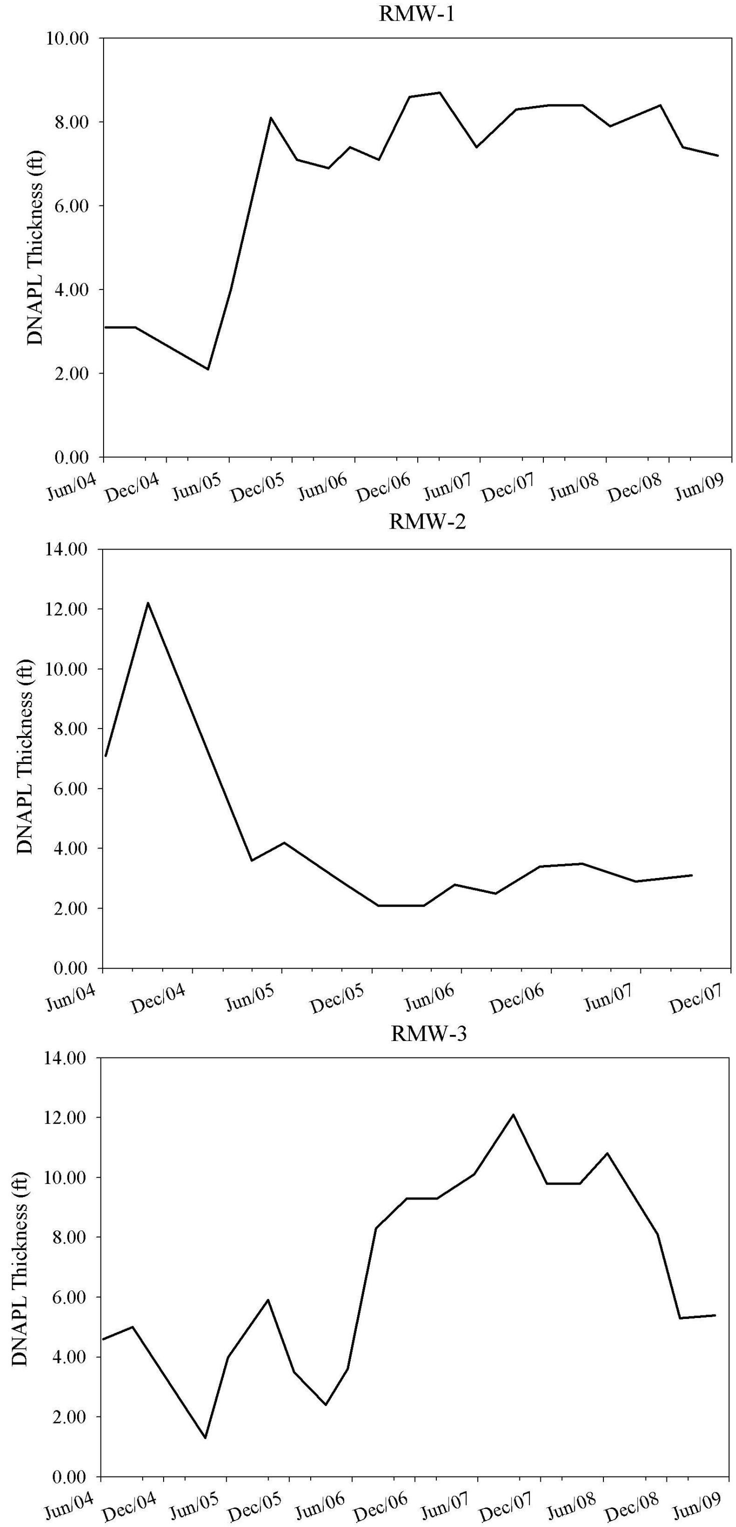
GRADIENT CORPORATION

Manu Sharma, P.E.
Principal

[6] US EPA. 2004. How to Evaluate Alternative Cleanup Technologies for Underground Storage Tank Sites – A Guide for Corrective Action Plan Reviewers. Office of Solid Waste and Emergency Response. EPA 510-R-04-002. May 2004.
[7] US EPA. 2004. In-situ Thermal Treatment of Chlorinated Solvents: Fundamentals and Field Applications. Office of Solid Waste and Emergency Response. EPA/542-R-04-010. March 2004.
[8] US EPA. 2000. Dense Non-Aqueous Phase Liquids (DNAPLs): Review of Emerging Characterization and Remediation Technologies. Interstate Technology and Regulatory Council (ITRC). June 2000.

DRAFT

Figure 1
DNAPL Thicknesses Observed in Detrex Source Control Monitoring Wells
Detrex Facility, Fields Brook Superfund Site, Ashtabula, OH



Source: Detrex Corporation. 2009. Monthly Status Report – April 2009, Fields Brook Superfund Site, Detrex Source Area, Ashtabula, Ohio. May 14, 2009.

Attachment B

Photographs Taken on June 16, 2011 in DS Tributary – West and East of State Road

Photo B.1 DS Tributary box culvert, west of State Road.

Photo B.2 Detrex DNAPL globules in DS Tributary surficial sediment, immediately west of the State Road culvert.

Photo B.3 Detrex DNAPL and sheen on DS Tributary surface water, immediately west of the State Road culvert.

Photo B.4 Detrex DNAPL, in DS Tributary surface water sample obtained west of State Road, adhering to glass vial.

Photo B.5 DS Tributary culvert east of State Road.

Photo B.6 Visible sheen emanating from disturbed sediments in DS Tributary, east of State Road.

Photo B.7 Visible sheen emanating from disturbed sediments in DS Tributary, east of State Road.

Photo B.8 Visible sheen emanating from disturbed sediments in DS Tributary, east of State Road.